



Rhinosinusitis and Risk Factors

Indra Setiawan

**Department of Ear, Nose and Throat, Faculty of Medicine, University of Muhammadiyah
Malang**

Email : indra@umm.ac.id

Receive : Apr 8th2023. Revised : May 7th2023. Published: Jun 30th2023

DOI: <https://doi.org/10.22219/sm.Vol19.SMUMM1.27537>

ABSTRACT

Rhinosinusitis is clinical syndrome characterized by ongoing or persistent symptoms of inflammation of the nasal mucosa and paranasal sinuses, namely nasal congestion, mucopurulent nasal mucus, facial pain, disturbance of smell, or cough for more than 12 weeks. The purpose of this study was to determine the risk factors affecting Chronic Rhinosinusitis. A search of studies was conducted in the main databases such as GoogleScholar, Pubmed, and Cochraine with publication time within the last 8 years and a total of 9 articles were found. Articles are selected by titles, abstracts and full text. Data is extracted by population/patient, interventions/indicators, outcome, impact and study type as well as general information from articles are also included.

Keywords : Rhinosinusitis, Etiology, Risk factors.

Copyright © 2023, Indra Setiawan

This is an open access article under the CC-BY-SA license

INTRODUCTION

Rhinosinusitis is a clinical syndrome characterized by symptoms of continuous or persistent inflammation of the nasal mucosa and paranasal sinuses, namely nasal congestion, mucopurulent nasal mucus, facial pain, disturbance of smell, or cough for more than 12 weeks. In-depth examination of the risk factors associated with chronic rhinosinusitis (CRS) yielded results of smoking, ciliary dyskinesia, genetics, co-occurring disorders, and environmental factors.

METHODS

The method used in this research was literature study from 7 references sourced through GoogleScholar, Pubmed, and Cochraine with publication time within the last 8 years. The inclusion criteria used were: 1) The articles included in this study were research articles, editorials, comments, literature reviews in quantitative, qualitative or mixed methods research;; 3) Articles containing topics about risk factors affecting Chronic Rhinitis; 4) Articles published in reputable journals both indexed by Scopus and non Scopus. The purpose of this study was to determine the risk factors affecting Chronic Rhinosinusitis. Articles are selected by titles, abstracts and full text. Data is extracted by

population/patient, interventions/indicators, outcome, impact and study type as well as general information from articles are also included.

RESULTS AND DISCUSSION

The first article "Early life risk factors for chronic sinusitis: A longitudinal birth cohort study" by Eugene H. Chang MD et al. presents a comprehensive study on the early life risk factors for adult sinusitis. The study identifies a phenotype of early-onset chronic sinusitis linked to allergies, asthma, and a propensity for childhood colds and viral infections.

According to the survey, 12.2% of adults and 10.8% of children had sinusitis. The most significant independent risk factor for adult sinusitis was found to be childhood sinusitis. Increased serum IgE levels, atopy (determined by skin prick test reactivity), childhood eczema and allergic rhinitis, frequent childhood colds, and maternal asthma were all linked to early onset chronic sinusitis. The study also discovered that people with early-onset chronic sinusitis had a higher prevalence of concomitant asthma.

A main phenotype of chronic sinusitis, early onset chronic sinusitis, has its origins in infancy and is substantially correlated with maternal asthma and future development of asthma, according to this longitudinal cohort study. The study contends that early allergic sensitization is essential for the emergence of chronic sinusitis with early onset. The results emphasize the significance of early detection and treatment of atopic diseases in children to perhaps delay the onset of chronic sinusitis and asthma in later life.

According to the study's findings, asthmatic moms are a substantial risk factor for childhood sinusitis, and their children are more likely to experience sinusitis at a young age. Atopy, eczema, and allergic rhinitis were also discovered to be linked to early onset chronic sinusitis, indicating that early allergic sensitization is crucial for the development of this phenotype. On the other hand, there were no early life risk factors that could be identified for late-onset adult sinusitis.

This study underscores the need for additional research to clarify the molecular mechanisms behind this phenotype and offers insightful information on the early life risk factors for chronic sinusitis. Future treatments to stop the condition from developing into adult sinusitis might result from this.

The study's shortcomings include the absence of supporting medical data, such as endoscopy, specific radiologic abnormalities, and drug use, that are necessary for the diagnosis of sinusitis. Given the variety of doctors, hospitals, and nearly 40 years of data collection, access to medical records pertaining to sinusitis was not planned for in the study and would have been challenging. Additionally, there is a chance that doctors will perform pointless tests in patients who have had rhinosinusitis in the past.

As a result, this study significantly advances our knowledge of the early life risk factors for chronic sinusitis. A number of risk variables, such as maternal asthma and early allergy sensitization (especially to *Alternaria*), were identified in the study as contributing to childhood sinusitis. The research also revealed a high correlation between maternal asthma and the development of asthma and a phenotype of early onset chronic

sinusitis, defined by indications of a type 2 immune response and persistence into adulthood. The discovery of a phenotype of early-onset chronic sinusitis linked to allergies, asthma, and a propensity for viral infections/colds in childhood may pave the way for the creation of preventive measures and treatments.

The second article, "Occupational and environmental risk factors for chronic rhinosinusitis: a systematic review," offers a thorough analysis of the probable occupational and environmental factors that might be involved in the development and progression of chronic rhinosinusitis (CRS). The study highlights the significance of comprehending how risky exposures contribute to the development of CRS, including the diversification of the condition into two distinct phenotypes (with or without nasal polyps) and the progression to the exacerbation or difficult-to-treat stage.

In order to find pertinent studies on the relationships between occupational and environmental exposures and CRS, the study used a systematic review of the literature. The authors stated that these exposures may have a major impact because the nasal and paranasal mucosa are the first line of defense against inhaled toxins, toxicants, and pollutants. Epithelial barrier failure, inflammatory dysregulation, and decreased innate immunity are all possible paths to CRS that could be brought on by these exposures.

The majority of CRS research, according to the authors, have been carried out in tertiary care facilities, concentrating on the most severe cases. They contend that occupational and environmental epidemiology studies, which ought to be population-based and cover the complete range of the disease, are ineligible for using this strategy.

In the discussion of this literature review, it is essential to highlight the need for more comprehensive and population-based studies to fully understand the impact of occupational and environmental factors on the onset and progression of CRS. The findings from this review underscore the importance of preventive interventions in occupational and environmental settings to mitigate the risk of CRS.

The analysis also indicates that future studies should concentrate on identifying discrete phenotypes and illness stages of CRS because, when CRS is seen as a single entity, consistent genetic and environmental risk factors have not been consistently discovered. This strategy might result in interventions and therapies for CRS patients that are more focused and efficient.

In conclusion, the study highlights the need for more research in this field by offering insightful information about the contribution of occupational and environmental factors to CRS. There is a crucial information gap because the risk factors for the development, progression, and subtypes of chronic rhinosinusitis (CRS) linked to hazardous occupational and environmental exposures have not been well investigated in the existing scientific literature. Since most studies used a cross-sectional design, which does not provide causal inferences, the literature to date is insufficient to draw conclusions about the association between the exposures studied and CRS. The role of hazardous occupational and environmental exposures in the onset, natural history, and phenotypic expression of CRS has not been sufficiently characterized due to poorly determined exposures and outcomes, an inability to evaluate between-study findings, and the use of biased research methods. The findings highlight the value of preventive measures in workplace and

environmental contexts as well as the necessity of further specialized research and interventions for various CRS phenotypes and stages.

The third article titled "Prevalence and Risk Factor of Chronic Rhinosinusitis and the Impact on Quality of Life in Students of the Medical Faculty Christian University of Indonesia in 2018" provides a detailed analysis of the relationship between the quality of life and nasal obstruction in patients suffering from chronic rhinosinusitis (CRS). The study emphasizes the importance of understanding the impact of CRS on a patient's quality of life, which can be significantly affected by nasal symptoms, facial/ear symptoms, sleep disturbances, and psychological changes.

Student participants in the authors' descriptive, cross-sectional study were from the Christian University of Indonesia's Faculty of Medicine. The Sinonasal Outcome Test-22 (SNOT-22) questionnaire was used in the study to gauge the quality of life of CRS patients. The four topics covered by the questionnaire are nasal symptoms, facial/ear problems, sleep issues, and psychological changes.

The risk factor for chronic rhinosinusitis that was examined in this study was a history of allergies, and the findings indicated that there was a statistically significant correlation between this risk factor and the incidence of chronic rhinosinusitis. This result is in line with earlier studies that found allergies to be a risk factor for chronic rhinosinusitis. To enhance the quality of life of individuals with chronic rhinosinusitis, it is crucial to evaluate and treat allergies.

The study found that nasal symptoms, particularly nasal obstruction, significantly affect the quality of life of CRS patients. These symptoms can lead to sleep disturbances, reduced appetite, difficulty in preparing food, and concentration issues. Furthermore, the inability to detect odors such as food, gas, smoke, and chemicals can interfere with certain professions and social interactions, leading to functional and emotional health issues.

In this study, the most common clinical symptom experienced by respondents with chronic rhinosinusitis was nasal congestion, with 65 people (91.5%) reporting this symptom. Other common symptoms included dizziness (85.9%) and nasal secretions (83.1%). For the facial/ear symptoms were reported by a significant number of respondents with chronic rhinosinusitis. Specifically, 61 people (85.9%) reported dizziness, which can be a result of sinus pressure and inflammation affecting the inner ear. Other facial symptoms such as pain or pressure in the face were not specifically mentioned in this study. However, according to previous research, facial pain or pressure can be a common symptom of chronic rhinosinusitis.

In this study, chronic rhinosinusitis was found to cause sleep disturbances and psychological changes in patients, which can significantly affect their quality of life. But the study did not provide specific data on the prevalence of sleep disturbances and psychological changes among respondents with chronic rhinosinusitis. However, previous research has shown that chronic rhinosinusitis can cause psychological disorders and sleep disturbance.

In discussing this literature review, it is crucial to highlight the importance of managing the symptoms of CRS, particularly nasal obstruction, to improve the quality of life of patients. The study underscores the need for effective treatment strategies that not only address the physical symptoms but also the psychological impact of the disease.

The limitations of the study include its focus on a specific population (medical students) and the use of a self-reported questionnaire, which may be subject to bias. Future research could benefit from a more diverse population and the use of objective measures to assess the impact of CRS on the quality of life.

This study sought to ascertain the prevalence of chronic rhinosinusitis, the relationship between a history of allergies and chronic rhinosinusitis, and how chronic rhinosinusitis affected medical students' quality of life. The study discovered that nasal congestion, lightheadedness, and nasal secretions were the most typical signs of chronic rhinosinusitis among medical students. Chronic rhinosinusitis was strongly related with a history of allergies, and all respondents who had the condition said it had a negative impact on their quality of life. The study emphasizes the significance of diagnosing, treating, and controlling chronic rhinosinusitis and related symptoms to enhance patient quality of life.

The prevalence and risk factors of chronic rhinosinusitis (CRS) in the elderly population of Korea are extensively discussed in the fourth article, "Prevalence and Risk Factors of Chronic Rhinosinusitis in the Elderly Population of Korea." The authors highlight the unique etiology and clinical manifestations of CRS in the elderly, suggesting that treatment for older CRS patients may need alternative or additional therapeutic modalities.

Using information from the Korean National Health and Nutrition Examination Survey, which was conducted from 2008 to 2012, the authors conducted a cross-sectional analysis. A total of 25,529 of the 45,811 participants who were sampled from 16 different provinces in South Korea were qualified for the study. In comparison to younger persons, they discovered that the prevalence of CRS was much higher in the elderly. It's interesting to note that the study discovered that while there was no correlation in the senior group, various socioeconomic and mental health factors in the adult group were linked to a higher risk of CRS. Poor mental health is more prevalent among people with low socioeconomic level and physical sickness, according to the World Health Organization.

In both groups, the study also discovered a substantial correlation between the prevalence of CRS and co-occurring allergic rhinitis, asthma, and atopic dermatitis. The connections with allergic rhinitis and asthma, however, were noticeably less in the senior population. This indicates that aging may be involved in waning eosinophilic inflammation, and this relationship was confirmed in previous studies. It also suggests that CRS in the elderly may have distinct pathophysiology from adult CRS, possibly due to age-related changes in immune function and inflammatory responses. The pathogenesis of CRS in the elderly is known to be influenced by age-related alterations in eosinophilic function implicated in airway inflammation.

The occurrence of spontaneous persistent systemic inflammation with aging, sometimes known as "inflammaging," is another finding that supports immunosenescence.

It is essential to emphasize the particular features of CRS in the elderly population when addressing this research review. The findings highlight the necessity for customized treatment plans for older CRS patients, taking into account their unique pathophysiology and clinical manifestations. The study also highlights the significance of controlling CRS in both adult and elderly patients while taking into account concomitant disorders like allergic rhinitis, asthma, and atopic dermatitis.

The cross-sectional form of the study is one of its drawbacks because it makes it impossible to establish causal links between the circumstances. Because the study was done using self-administered questionnaires, there may potentially be some response bias in the reporting of numerous characteristics, such as lifestyle habits and mental health assessments. Additionally, a questionnaire on nasal symptoms was used to make the diagnosis of CRS in the absence of endoscopic results. A longitudinal study design may be advantageous for future research to confirm the cumulative impact of age on CRS prevalence and risk variables.

In conclusion, the study offers insightful information about the incidence and risk factors of CRS in Korea's old population. CRS prevalence was noticeably higher among the elderly than among younger adults. There are age-related changes in eosinophilic function implicated in airway inflammation that alter the pathophysiology of CRS in the elderly. In the old group, the relationships were substantially weaker with regard to allergic rhinitis and asthma.

This shows that the pathophysiology of CRS in the elderly may be different from that of CRS in adults. The results highlight the necessity for specialized treatment plans for older CRS patients as well as more study to comprehend the unique biology and clinical manifestations of CRS in this population.

A thorough examination of the symptoms and risk factors related to chronic rhinosinusitis with nasal polyps (CRSwNP) is given in the fifth article, "Relative frequencies of symptoms and risk factors among patients with chronic rhinosinusitis with nasal polyps using a case-control study." In a case-control research, the authors interviewed 368 patients with CRSwNP and 1349 controls in an organized manner regarding their symptoms in the upper and lower airways as well as their smoking habits.

The symptoms of the prevalent disease chronic rhinosinusitis with nasal polyps (CRSwNP) negatively affect the quality of life for the patient. According to all analyses, including a multivariate logistic regression model, male sex is a risk factor for the condition. According to studies, the prevalence of nasal polyps rises with age, and CRSwNP is significantly linked to nasal secretion, nasal obstruction, and reduced olfaction. Additionally substantially linked with CRSwNP were nasal discharge and nasal obstruction. Studies demonstrating a higher prevalence of asthmatics in study groups with CRSwNP compared to controls suggest the association between CRSwNP and asthma.

Asthma sufferers are more likely than those without asthma to experience CRSwNP. Cough and cold sensitivity were not significant variables in the multivariate analysis in this study, most likely because of their correlation with asthma rather than CRSwNP. Smoking is another contentious factor in CRSwNP, with prior research demonstrating a favorable correlation between direct cigarette use and the presence of nasal polyps during surgery. Studies have not found a link between smoking and the condition, though this may be because

smoking patterns vary throughout cultures and geographical areas. According to the study, there is a statistically significant link between CRSwNP and smoking, which may indicate that smoking does not offer protection from CRSwNP.

In discussing this literature review, it is crucial to highlight the unique characteristics of CRSwNP and the associated symptoms and risk factors. The findings underscore the need for effective management strategies that not only address the physical symptoms but also consider the associated risk factors such as gender, age, and asthma.

The study's shortcomings include the fact that participants were only permitted to report predetermined symptoms, restricting the assessment of symptoms to those. As a result, it's possible that this study overlooked symptoms that are significant for people with CRSwNP. The study's key advantages include its size, the inclusion of a representative control group from the same region, and the fact that every participant underwent a clinical evaluation, which included a nasal endoscopy.

In conclusion, the study provides valuable insights into the symptoms and risk factors associated with CRSwNP. The findings underscore the need for comprehensive management strategies that address both the physical and associated risk factors of the disease. Future research could benefit from allowing participants to report their symptoms freely to capture a more comprehensive picture of the symptoms associated with CRSwNP.

In the sixth article, "Risk Factors and Comorbidities in Chronic Rhinosinusitis," the risk factors and comorbidities connected to chronic rhinosinusitis (CRS) are thoroughly analyzed. The authors draw attention to the fact that CRS is a complex condition that places a heavy cost on the healthcare system. It is brought on by a confluence of inflammatory, external, and internal host elements. However, there is still disagreement over the precise process by which each component contributes to CRS.

The authors go over a number of comorbidities and risk factors related to CRS. They draw attention to the fact that extensive population-based studies have contributed to making smoking a recognized risk factor for CRS. Now, the emphasis is on smoking's impact on long-term results following endoscopic sinus surgery (ESS). Both primary and secondary ciliary dyskinesia can simultaneously influence the sinonasal cavity and lower airways by reducing cilia's beat frequency and causing mucostasis. There is some evidence to suggest that topical mucolytics should be used in patients with CRS since the consequences of secondary dyskinesia may be reversible.

In discussing this literature review, it is crucial to highlight the complexity of CRS and the associated risk factors and comorbidities. The findings underscore the need for effective management strategies that not only address the physical symptoms but also consider the associated risk factors such as smoking and ciliary dyskinesia.

The study's shortcomings include the fact that the quality of the evidence is still low, the study's design is highly heterogeneous, the results are inconsistent, and there aren't many high-quality studies available. The

thorough analysis of recent literature on CRS risk factors and comorbidities is one of the study's primary advantages.

In conclusion, the study offers insightful information about the comorbidities and risk factors related to CRS. with the risk factors like smoking and ciliary dyskinesia that go along with it.

The seventh article, "Risk factors for chronic rhinosinusitis," by Bruce K. Tan and Jin-Young Min offers a thorough analysis of recent research on risk factors for chronic rhinosinusitis (CRS), with a focus on the genetic, comorbid, and environmental factors related to CRS. The authors' goal is to pinpoint probable CRS risk factors in order to gain knowledge of the underlying pathogenic mechanisms necessary for creating efficient therapy approaches.

The authors explore the wide range of correlations between CRS and many factors, including genetics, concomitant conditions, and environmental factors. They emphasize that current research has shown that having a CRS diagnosis is correlated with genetics, comorbid medical illnesses like respiratory diseases, gastric reflux disease, inflammatory and autoimmune diseases, and numerous demographic and environmental factors. However, the present studies have some drawbacks, such as inconsistent use of disease criteria, a dearth of prospective longitudinal studies, and an over concentration on patients receiving tertiary care.

In discussing this literature review, it is crucial to highlight the complexity of CRS and the associated risk factors and comorbidities. The findings underscore the need for effective management strategies that not only address the physical symptoms but also consider the associated risk factors such as genetics, comorbid diseases, and environmental factors.

The study's shortcomings include an uneven use of disease classifications, a dearth of prospective longitudinal research, and an over concentration on people receiving tertiary care. The thorough analysis of contemporary research on CRS risk factors is one of the study's primary advantages.

In conclusion, there are a number of risk factors for chronic rhinosinusitis (CRS), including hereditary, concomitant medical, and environmental variables. CRS has been linked to comorbid conditions like asthma, GERD, and autoimmune illnesses as well as demographic and environmental factors like age, sex, tobacco use, and air quality. Although the majority of recent study designs do reveal relationships, causality and dose-response are still unknown. To fully comprehend these risk variables' biological impacts in relation to CRS, more research is required.

The study provides valuable insights into the risk factors for CRS. The findings underscore the need for comprehensive management strategies that address both the physical and associated risk factors of the disease. Future research could benefit from more high-quality studies to continue refining our knowledge of the disease processes in CRS

CONCLUSION

Chronic rhinosinusitis (CRS) is a complex disease with a multifaceted etiology. Understanding risk factors and comorbidities is crucial for comprehensive management strategies that address both physical symptoms and associated risk factors. Patients with asthma including maternal asthma and early allergic sensitization, occupational environment, atopic inflammatory, genetic, comorbid medical such as asthma, GERD, and autoimmune diseases, as well as demographic and environmental factors such as age, sex, tobacco exposure, and air quality are the risk factors of CRS.

Population-based studies and high-quality research are essential for refining our understanding of CRS. The disease's severity, particularly in relation to nasal obstruction and acute exacerbations, requires tailored management strategies. The heterogeneity of CRS suggests that management strategies may need to be tailored to individual patients, considering their specific risk factors and disease characteristics.

Further research is needed to further elucidate the complex etiology of CRS and develop effective therapeutic strategies and preventive interventions. The ultimate goal is to improve the quality of life for individuals with CRS by providing targeted and effective treatments.

REFERENCES

- Bohman, A., Oscarsson, M., Holmberg, K., Johansson, L., Millqvist, E., Nasic, S., & Bende, M. (2018). Relative frequencies of symptoms and risk factors among patients with chronic rhinosinusitis with nasal polyps using a case-control study. *Acta Oto-Laryngologica*, 138(1), 46–49. <https://doi.org/10.1080/00016489.2017.1366052>
- Chang, E. H., Stern, D. A., Willis, A. L., Guerra, S., Wright, A. L., & Martinez, F. D. (2018). Early life risk factors for chronic sinusitis: A longitudinal birth cohort study. *Journal of Allergy and Clinical Immunology*, 141(4), 1291-1297.e2. <https://doi.org/10.1016/j.jaci.2017.11.052>
- Hwang, C. S., Lee, H. S., Kim, S. N., Kim, J. H., Park, D. J., & Kim, K. S. (2019). Prevalence and Risk Factors of Chronic Rhinosinusitis in the Elderly Population of Korea. *American Journal of Rhinology and Allergy*, 33(3), 240–246. <https://doi.org/10.1177/1945892418813822>
- Kern, R. C., Stewart, W. F., & Schwartz, B. S. (2018). Prevalence, severity, and risk factors for acute exacerbations of nasal and sinus symptoms by chronic rhinosinusitis status. *Allergy: European Journal of Allergy and Clinical Immunology*, 73(6), 1244–1253. <https://doi.org/10.1111/all.13409>
- Kuiper, J. R., Hirsch, A. G., Bandeen-Roche, K., Sundaresan, A. S., Tan, B. K., Schleimer, R. P., Min, J. Y., & Tan, B. K. (2015). Risk factors for chronic rhinosinusitis. In *Current Opinion in Allergy and Clinical Immunology* (Vol. 15, Issue 1, pp. 1–13). Lippincott Williams and Wilkins. <https://doi.org/10.1097/ACI.0000000000000128>
- Poluan, F. H., & Marlina, L. (2021). Prevalence and Risk Factor of Chronic Rhinosinusitis and the Impact on Quality of Life in Students of the Medical Faculty Christian University of

Indonesia in 2018. *Journal of Drug Delivery and Therapeutics*, 11(3-S), 154–162.
<https://doi.org/10.22270/jddt.v11i3-s.4846>

Sundaresan, A. S., Hirsch, A. G., Storm, M., Tan, B. K., Kennedy, T. L., Greene, J. S., Kern, R. C., & Schwartz, B. S. (2015). Occupational and environmental risk factors for chronic rhinosinusitis: A systematic review. In *International Forum of Allergy and Rhinology* (Vol. 5, Issue 11, pp. 996–1003). John Wiley and Sons Inc. <https://doi.org/10.1002/alr.21573>

Tint, D., Kubala, S., & Toskala, E. (2016). Risk Factors and Comorbidities in Chronic Rhinosinusitis. In *Current Allergy and Asthma Reports* (Vol. 16, Issue 2, pp. 1–7). Current Medicine Group LLC 1. <https://doi.org/10.1007/s11882-015-0589-y>